

WHAT IS CLAIMED IS:

1. A coil assembly for a heat exchanger, comprising:
 - an array of at least two serpentine circuits, each circuit including longitudinal tube sections of an effective diameter D , return bend sections of an effective diameter D , and inlet and outlet ends,
 - the at least two serpentine circuits are stacked in a staggered planar arrangement with adjacent return bends being at least partially overlapping;
 - at least one of the at least two serpentine circuits being provided with at least one depression area coinciding with the point of overlap with the return bend of an adjacent one of the serpentine circuits,
 - wherein the at least two serpentine circuits are densely packed so that adjacent ones of the serpentine tubes nest in the at least one depression area to provide a circuit-to-circuit packing density D/S greater than 1.02, where S is the spacing between each adjacent circuit and D is the effective diameter of the tubes.
2. The coil assembly according to claim 1, wherein the depression area has a depth of between 2.5-50% of the diameter D .
3. The coil assembly according to claim 1, wherein the depression area has a depth of between 1/32" - 1/2".
4. The coil assembly according to claim 1, wherein the depression area has a profile that substantially matches the adjacent return bend at the point of overlap.
5. The coil assembly according to claim 4, wherein the profile is semi-cylindrical.
6. The coil assembly according to claim 1, wherein the depression area is provided on at least one of the top and bottom sides of at least alternating ones of the serpentine tubes.
7. The coil assembly according to claim 6, wherein the depression area is provided on both of the top and bottom sides of alternating ones of the serpentine tubes.
8. The coil assembly according to claim 6, wherein the depression area is provided on the top and bottom sides of all intermediate ones of the serpentine tubes in the array and each depression area has a depth of between 1.25% to 25% of the diameter D .
9. The coil assembly according to claim 6, wherein the depression area is provided on both left and right extremities of the top or bottom side to accommodate offset and overlap in either direction.

10. The coil assembly according to claim 1, wherein the depression area is achieved by forming at least the point of overlap of the return bends into a flattened cross-section shape.

11. The coil assembly according to claim 1, wherein the depression area is formed by a dimple.

12. The coil assembly according to claim 1, wherein the at least two serpentine circuits includes three or more circuits and the circuit-to-circuit spacing S is uniform between all of the serpentine circuits of the coil assembly.

13. A heat exchanger, comprising:
an array of at least two serpentine circuits, each circuit including longitudinal tube sections of an effective diameter D , return bend sections, and inlet and outlet ends,
the at least two serpentine circuits are stacked in a staggered planar arrangement with adjacent return bends being at least partially overlapping;
at least one of the at least two serpentine circuits being provided with at least one depression area coinciding with the point of overlap with the return bend of an adjacent one of the serpentine circuits,
an inlet manifold connected to the inlets of each of the at least two serpentine tubes;
an outlet manifold connected to the outlets of each of the at least two serpentine tubes; and
a conduit of a predetermined size housing the coil assembly and including a gas inlet and outlet,
wherein the array of serpentine circuits are densely packed so that adjacent ones of the serpentine circuits nest in the at least one depression area to provide a circuit-to-circuit packing density D/S greater than 1.02, where S is the spacing between each adjacent circuit and D is the effective diameter of the tubes.

14. The heat exchanger according to claim 13, further comprising a fan arranged to move a gas from the conduit gas inlet, through the coil assembly and out the conduit gas outlet.

15. The heat exchanger according to claim 14, further comprising a liquid distribution system arranged above the coil assembly to distribute liquid down over the coil assembly.

16. The heat exchanger according to claim 13, wherein the heat exchanger is an evaporative heat exchanger.

17. The heat exchanger according to claim 16, wherein the evaporative heat exchanger is an indirect heat exchanger.

18. The heat exchanger according to claim 16, wherein the evaporative heat exchanger includes both a direct evaporative heat exchanger system and an indirect evaporative heat exchanger system.

19. The heat exchanger according to claim 18, wherein the heat exchanger is of the coil/fill type.

20. A coil assembly for a heat exchanger, comprising:
an array of serpentine circuits, each circuit including longitudinal tube sections of an effective diameter D , return bend sections, and inlet and outlet ends,
the array of serpentine circuits is stacked in a staggered planar arrangement with adjacent return bends being at least partially overlapping; and
a depression area coinciding with each point of overlap of the return bends of adjacent serpentine circuits being provided on a surface of at least one of the overlapping return bends, each depression area defining a region of reduced diameter,
an inlet manifold connected to the inlets of each of the at least two serpentine circuits;
an outlet manifold connected to the outlets of each of the at least two serpentine tubes; and
a conduit of a predetermined size housing the coil assembly and including a gas inlet and outlet,
wherein the array of serpentine circuits are densely packed with adjacent ones of the serpentine circuits nesting in the depression area and defining a uniform circuit-to-circuit spacing S between each adjacent circuit that is less than the effective diameter D of the tubes.

21. The coil assembly according to claim 20, wherein the region of reduced diameter has a depth of between 2.5-50% of tube diameter D .

22. The coil assembly according to claim 21, wherein the region of reduced diameter is provided only around the point of overlap in the return bends to minimize internal fluid pressure drop.

23. A heat exchanger, comprising:
the coil assembly of claim 20;
an inlet manifold connected to the inlets of each of the at least two serpentine circuits;

an outlet manifold connected to the outlets of each of the at least two serpentine tubes; and

a conduit of a predetermined size housing the coil assembly and including a gas inlet and outlet.